



GRADE 12 EXAMINATION
NOVEMBER 2015

**ADVANCED PROGRAMME MATHEMATICS
ELECTIVE MODULE: FINANCE AND MODELLING**

MARKING GUIDELINES

Time: 1 hour

100 marks

These marking guidelines are prepared for use by examiners and sub-examiners, all of whom are required to attend a standardisation meeting to ensure that the guidelines are consistently interpreted and applied in the marking of candidates' scripts.

The IEB will not enter into any discussions or correspondence about any marking guidelines. It is acknowledged that there may be different views about some matters of emphasis or detail in the guidelines. It is also recognised that, without the benefit of attendance at a standardisation meeting, there may be different interpretations of the application of the marking guidelines.

QUESTION 1

- 1.1 (a) A (2)
 (b) D (2)
 (c) B (2)
- 1.2 (a) R780 000 (1)
 (b) 14% (2)
 (c) R366 933,07 (2)
- [11]**

QUESTION 2

$$2.1 \quad P_v = \frac{8\,645 \left[1 - \left(1 + \frac{0,072}{12} \right)^{-180} \right]}{\frac{0,072}{12}} \quad P_v = R\,949\,951,21 \quad (5)$$

$$2.2 \quad 8\,645 - 949\,951,21 \left(\frac{0,072}{12} \right) = \mathbf{2\,945,29}$$

OR $949\,951,21 \left(1 + \frac{0,072}{12} \right) - 8\,645 = 947\,005,92$

$$949\,951,21 - 947\,005,92 = 2\,945,29 \quad (4)$$

$$2.3 \quad \left(1 + \frac{0,072}{12} \right)^{12} = \left(1 + \frac{i}{365} \right)^{365}$$

$$\frac{i}{365} = 0,000196 \dots \quad i = \mathbf{7,1792\%} \quad (8)$$

[17]

QUESTION 3

$$3.1 \quad 1\,200\,000 = \frac{x \left[1 - \left(1 + \frac{0,0624}{12} \right)^{-240} \right]}{\frac{0,0624}{12}} \quad x = 8\,764,15$$

$$\text{Annual} = 8\,764,15 \times 3 \times 12 = \mathbf{R315\,509,24} \quad (8)$$

$$3.2 \quad OB = \frac{8\,764 \left[1 - \left(1 + \frac{0,0624}{12} \right)^{-112} \right]}{\frac{0,0624}{12}} + 17\,000 \left(1 + \frac{0,0624}{12} \right)^{13}$$

$$= 742\,580,92 + 18\,185,75 = \mathbf{R760\,766,67}$$

OR

$$OB = 1\,200\,000 \left(1 + \frac{0,0624}{12} \right)^{128} - \frac{8\,764 \left[\left(1 + \frac{0,0624}{12} \right)^{128} - 1 \right]}{\frac{0,0624}{12}} + 17\,000 \left(1 + \frac{0,0624}{12} \right)^{13}$$

$$= \mathbf{R760\,805,40} \quad (8)$$

$$3.3 \quad 761\,000 \left(1 + \frac{0,0624}{12} \right)^{112} - \frac{9\,200 \left(1 + \frac{0,0624}{12} \right) \left[\left(1 + \frac{0,0624}{12} \right)^{109} - 1 \right]}{\frac{0,0624}{12}}$$

$$= 1\,360\,386,80 - 1\,351\,662,47 = \mathbf{8\,724,32}$$

OR

$$761\,000 \left(1 + \frac{0,0624}{12} \right)^{111} - \frac{9\,200 \left[\left(1 + \frac{0,0624}{12} \right)^{109} - 1 \right]}{\frac{0,0624}{12}}$$

$$= 1\,353\,349,38 - 1\,344\,670,19 = 8\,679,19$$

$$8\,679,19 \left(1 + \frac{0,0624}{12} \right) = \mathbf{8\,724,32}$$

OR

$$761\,000 \left(1 + \frac{0,0624}{12} \right)^2 - \frac{9\,200 \left[1 - \left(1 + \frac{0,0624}{12} \right)^{-109} \right]}{\frac{0,0624}{12}}$$

$$768\,934,98 - 764\,003,71 = 4\,931,27$$

$$4\,931,27 \left(1 + \frac{0,0624}{12} \right)^{110} = \mathbf{8\,724,33} \quad (10)$$

[26]

QUESTION 4

4.1 (a) doubling happens at a constant rate every 35 years. (2)

(b) growth rate = birth – death

$$0,02 = \text{birth} - 1/56$$

$$\text{birth} = 0,037\ 857 = 3,79\%$$

(4)

4.2 (a) $A = \frac{0,054\ 571}{2,52} = 0,021\ 655$

$$B = \frac{7,22 - 2,52}{2020 - 1950} = 0,067\ 143$$

$$C = \frac{0,067\ 143}{5,12} = 0,013\ 114$$

$$D = \frac{10,12 - 5,12}{2055 - 1985} = 0,071\ 429$$

OR

$$D = 0,009\ 893 \times 7,22 = 0,071\ 427$$

(8)

(b) On calculator, $x = P$ and $y = \Delta P/P$

regression modelling for $y = A + Bx$:

$$A = 0,027\ 435 \approx 2,74\%$$

(4)

[18]

QUESTION 5

5.1 $1 / 0,083 = 12$ years

(2)

5.2 $\frac{b.f.L.W}{b.L.W} = \frac{0,000\ 000\ 169}{0,000\ 655} = 0,000\ 258$

(4)

5.3 $0,345 = 1 \times 1 \times 0,6 \times \text{female}$

$$\text{females} = 57,5\%$$

(4)

5.4 $W_{n+1} = W_n + 0,345.W_n \left(1 - \frac{W_n}{25\ 000}\right) - 0,000\ 655.W_n.L_n$ where $W_{n+1} = W_n$

$$0,345.W_n \left(1 - \frac{W_n}{25\ 000}\right) = 0,000\ 655.W_n.L_n$$

$$L_n = \frac{0,345 \cdot \left(1 - \frac{5\ 500}{25\ 000}\right)}{0,000\ 655}$$

$$L_n = 410,8 \approx 410 \text{ or } 411$$

(8)

[18]

QUESTION 6

6.1 $T_2 = 1 \quad T_3 = 2 \quad T_4 = 3$

$$T_5 = 5$$

(6)

6.2 $q = 0,8 < 1$

$$|p| = 2 \not< 0,8 + 1$$

not stable

(4)

[10]

Total 100 marks